

Bottle Opener

DESIGN RATIONALE

Introduction

The Bottle Opener provides a way for those with arthritis, limited finger dexterity or other related disabilities to open the lids on disposable beverage bottles. The original bottle opener, now named Bottle Opener 30, was created in February 2018. This design can open most pop bottles and disposable water bottles but cannot open the larger lids commonly seen on sports drinks, juice jugs and other bottles and containers. More sizes have been created to open various sizes of larger lids.

There are several somewhat “standard” sizes for the lids of beverage bottles. Some beverage bottles currently available in grocery stores in Victoria, B.C. are listed below:

All measurements of cap diameters are within 2mm less and 1mm greater than the listed value.

30mm	35mm	40mm	45mm	50mm
2 L pop bottle	1.89 L western family juice jug	591 mL Vitamin Water bottle	1.46 L SunRype Juice Jug	3 L Ocean Spray juice jug
1 L pop bottle	1 L Ketchup Bottle	950 mL Gatorade bottle	1.89 L Ocean Spray Juice Jug	
710 mL pop bottle	400 mL HP Sauce	4 L Milk Jug	945 mL Welch's Prune Nectar	
591 mL pop bottle	900 mL SunRype Juice Carton.	2 L Milk Jug	1.89 L Mott's Clamato Jug	
355 mL pop bottle		473 mL Milk 2 go bottle		
500 mL water bottle		1 L Liberte Kefir		
2 L Milk Carton				

Goals

G01	The device should cost less than the commercially available option.
G02	The device should provide an easier way to open large juice jugs for those with arthritis or limited finger dexterity.

Functional Requirements

F01	The device must adequately grip it's specific juice jug's lid to remove the factory seal.
F02	The device must easily slide on top on the juice jug lid such that there is some clearance between the lid and the device.



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Non-functional Requirement

NF01	The device must not engage any discomfort in the user's hand.
NF02	The device must be manufacturable in a single 3D print using PLA without the use of support material.
NF03	The device must not deform under the stress of daily use.

Constraints

C01	Single-build cost must be less than \$13
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Ideation

The new sizes of Bottle Openers aims to maintain the functionality of the original bottle opener while allowing for larger bottles. Some of the design considerations to accomplish this task include:

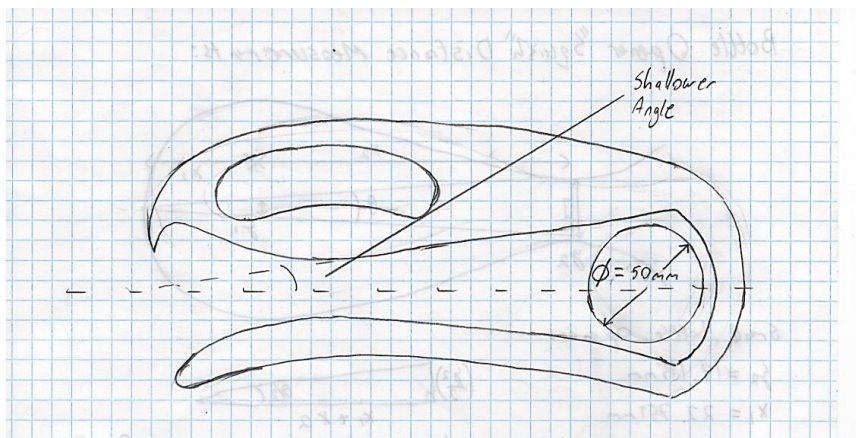
- Keeping the same handle dimensions and the same motion to squeeze the cap.
- Keeping the same general size for the device.
- Ensuring the Large Bottle Opener is not more difficult squeeze to grip the cap.
- Ensuring the Large Bottle Opener has adequate gripping capacity to open the lid.

Conceptual Design

The original handle and general shape will be copied with the cap opening being extended.

Concept 1

Extend the original angled toothed faces so that the gripping surface is identical, but the

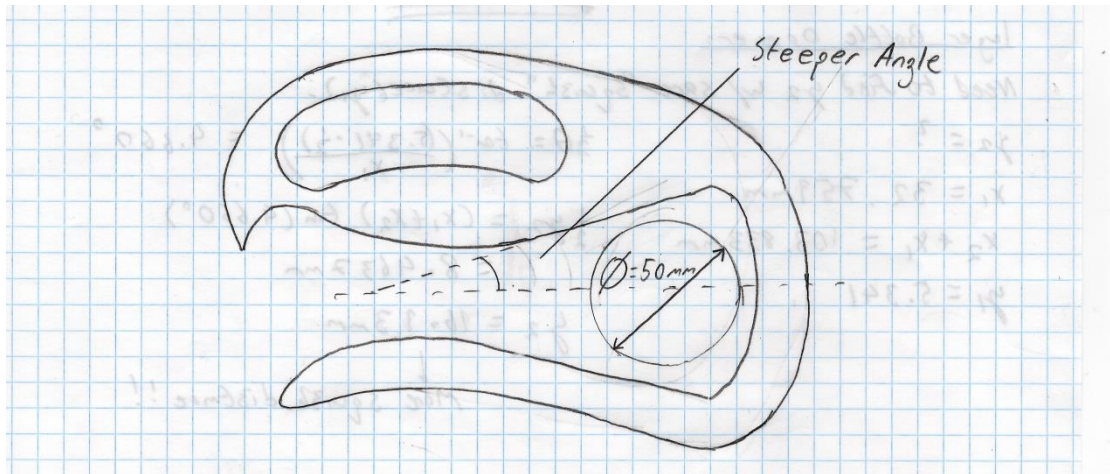


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Concept 2

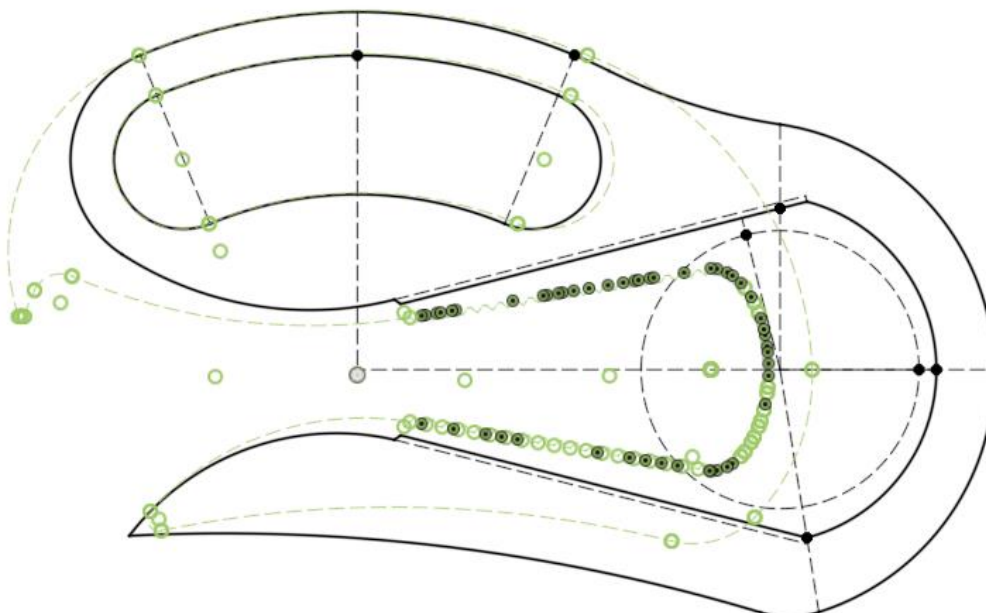
Steepen the angles and adjust the geometry to create a device of similar length. This design would create a smaller device, allowing for less material to be used making manufacturing quicker and more environmentally sustainable.



Detailed Design

Both conceptual designs were considered so that the gripping surface, gripping angle, length of device and material usage were optimized.

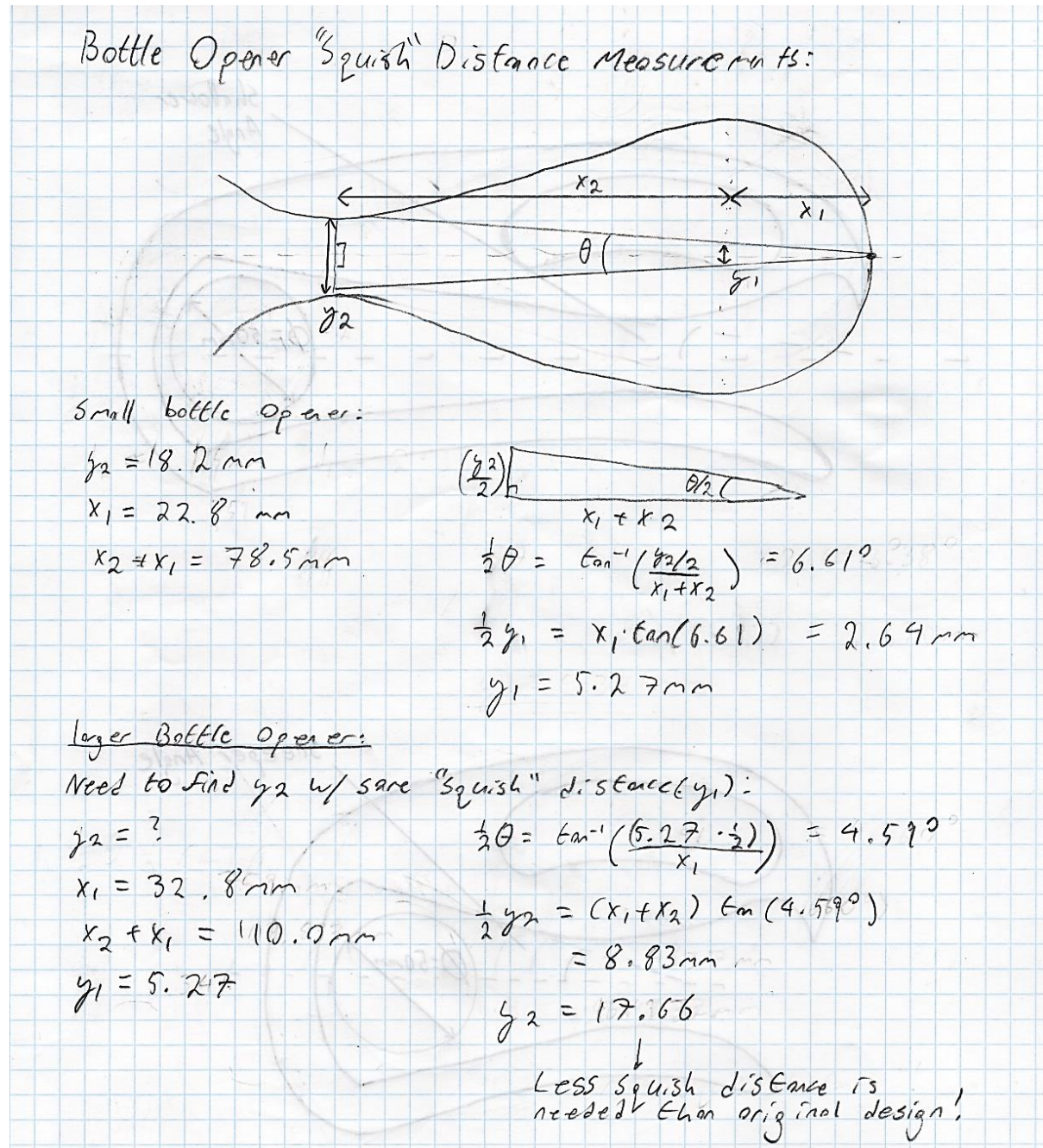
The general outlines of both the large bottle opener (Black) and the original bottle opener (Green) are shown below.



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The following calculation was done to ensure that the new design had enough "squeezing" distance to grip the cap. With the cap further away from the handle, squeezing the handle would result in less of that squeeze translating to movement in the cap end.



The result was that more distance between handles to squeeze the cap was not necessary. However, in testing it was found, possibly due to the longer flexing surface, that the device still needed a slightly bigger gap in this area to provide satisfactory grip, so this distance was increased anyway.

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Opportunities for Improvement

- A design could be considered that allows for the opening of multiple bottle cap sizes in one device.
- More designs could be made to suit different sizes of bottles.